



CASE REPORT

Endodontic treatment of developmental anomalies in posterior teeth: treatment of geminated/fused teeth – report of two cases

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Abstract

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Aim Gemination or fusion is a rare occurrence in the mandibular posterior teeth. Endodontic treatment of these teeth needs special care and attention to the bizarre anatomy. The aim of this article is to describe the problems encountered and the strategy in treating such cases.

Case report Two cases of complex endodontic treatment of fused/geminated teeth are presented. The first is an 11-year-old girl with an anomalous 'double' first mandibular molar and premolar diagnosed as having necrotic pulp with chronic apical abscess of endodontic origin; the second is a 16-year-old boy with 'double' second and supernumerary mandibular molars, who was diagnosed with irreversible pulpitis. Both cases were treated successfully in multiple appointments. The common features and treatment modalities are discussed.

Key learning points

- Failure to diagnose fused/geminated teeth leads to misdiagnosis and a treatment plan that could cause permanent damage and tooth loss.
- Generally, there is communication between root canal systems of fused/geminated teeth which should be treated as one entity.
- Use of magnification is an important aid during treatment.

Keywords: double teeth, endodontic treatment, fusion, gemination, supernumerary teeth.

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Introduction

Morpho-anatomic changes in teeth may be divided according to the site of their occurrence, i.e. tooth crown, roots and root canals. Gemination and fusion are anomalies with close similarity inherited by different aetiology. These anomalies may develop during tooth bud morphodifferentiation as a result of a developmental aberration of both the ectoderm and mesoderm (Grover & Lorton 1985). Its severity depends on the formation stage of the involved teeth. The prevalence of these anomalies is reported to be less than 1% (Levitas 1965), occurring predominantly in incisors and canines with apparent equal distribution between the two jaws, and are more common in deciduous teeth. They are very rare in molars (Levitas 1965, Brook & Winter 1970).

According to the stage of tooth development, different degrees of union of cementum, dentine and enamel are possible. Levitas (1965) describes gemination as an attempt of the tooth bud to divide. This partial division is arrested before tooth development is completed. The end result is a single tooth with a bifid crown, and the total number of teeth is normal. Fusion is a condition in which two separate tooth buds have a joined crown that resembles a bifid crown. When counted, the number of teeth is reduced by one. Four types of these anomalous teeth have been suggested (Tadahiro 1981): (i) concrescent teeth – two teeth fused by coalescence of their cementum; (ii) fused teeth – teeth joined by dentine in their developmental stage; (iii) geminated teeth – fusion of a tooth with a supernumerary one; and (iv) dens in dente.

The aetiology of fusion and gemination remains unclear. There are several hypotheses. Grover & Lorton (1985) claim that local metabolic interferences, which occur during morphodifferentiation of the tooth germ, may be the cause. They suggest that there could be a relationship amongst gemination, twinning and odontoma; another possibility is trauma (Lyroutdia *et al.* 1997). Gemination and fusion are generally asymptomatic and do not require treatment. However, there could be poor aesthetics, periodontal destruction or caries leading to pulp necrosis (Grover & Lorton 1985).

The purpose of this article is to describe two cases of successful endodontic treatment in posterior teeth with fusion/gemination anomalies.

Case reports

Case 1

An 11-year-old girl was referred for treatment of an anomalous tooth. The patient complained of swollen buccal mucosa in the mandibular right molar area. Her medical history was noncontributory. Two months earlier, she had undergone emergency treatment for an abscess in the same region for which the referring dentist administered antibiotics. Clinical examination revealed a large crown in the right mandible, comprising the mandibular first molar and second premolar crowns (Fig. 1). There was extensive occlusal caries in the molar. Swelling and a draining sinus tract were present buccal to the fused second premolar and first molar, and a retained deciduous molar. There was a 5 mm probing depth in the buccal area between the two fused crowns and the tooth was sensitive to percussion. Vitality tests were inconclusive: there was a slight response to cold (Endo Ice, Hygenic, Akron, OH, USA) and heat (hot gutta-percha stick), which was more pronounced at the site of the premolar crown. Electronic sensitivity tests provided similar results in all teeth of the mandibular right quadrant. Radiographic examination revealed a distal root and an unusually shaped mesial root resembling fusion of the roots of the second premolar and first molar (Fig. 2). A radiolucent area, 10 mm in diameter, with distinct borders was seen around the mesial root. Radiographic tracing with a gutta-percha point revealed that the sinus tract led



Figure 1 Fused crowns of the mandibular right first molar and second premolar.

to the radiolucent area. A test cavity through the carious area penetrated to the pulp chamber with no pain response. A diagnosis of necrotic pulp with chronic apical abscess of endodontic origin was established.

Two separate endodontic access cavities were prepared in the fused crown in the molar and the premolar area. A communication between the two cavities was discovered under the dentine septum. Five canal orifices were found – two leading to the distal root canals (emerging from the molar pulp chamber) and the other three leading to the mesial roots and emerging from the floor of the premolar pulp chamber.

The canals were instrumented manually using K-files and irrigated with 3% sodium hypochlorite solution. Working length was determined with an electronic apex locator (Apit VII, Osada, Tokyo, Japan) and confirmed by radiograph (Fig. 3). The tooth was medicated with Maisto's paste (Ingle 1965) and temporarily sealed with IRM (Caulk, Milford, DE, USA). The patient did not return for 2 months as the tooth was asymptomatic, the swelling had subsided, the sinus tract had disappeared and the buccal probing depth had reduced to 3 mm. The tooth was obturated after thorough irrigation with 3% sodium hypochlorite and 17% EDTA. A vertical condensation technique was employed using System-B (Analytic Endodontics, Orange, CA, USA) with gutta-percha and AH-26 (Dentsply, Konstanz, Germany), and the coronal access sealed with IRM (Caulk, Milford, DE, USA). The final radiograph revealed densely condensed root canal fillings in the five canals and reduction of



Figure 2 Preoperative radiograph of the fused mandibular right first molar and second premolar.

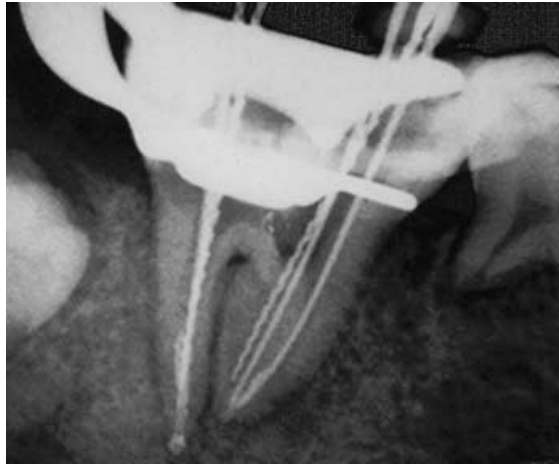


Figure 3 Working length radiograph of the fused mandibular right first molar and second premolar.

the periapical radiolucency (Fig. 4). Follow-up 6 months later showed that the tooth was restored with composite filling by the referring dentist. The tooth was asymptomatic and complete bone regeneration was seen on the radiograph (Fig. 5).

Case 2

A 16-year-old boy was referred for treatment of his mandibular right second molar. The patient complained of a sharp pain that prevented him from chewing on the right side. His medical history was noncontributory. One month earlier, the patient was seen by another dentist who assumed that there was a remnant of deciduous tooth adjacent to the mandibular right second molar, and attempted extraction. During the procedure, an extra mesiobuccal cusp of the second molar was found, which was cut by the dentist and which exposed the pulp chamber. A corticosteroid-antibiotic dressing was immediately placed into the pulp chamber and the amputated cusp was partially restored with temporary filling. Clinical examination revealed an anomalous second molar that could have been a fusion of



Figure 4 Radiograph of the fused mandibular right first molar and second premolar immediately on completion of endodontic treatment.



Figure 5 Six-month follow-up radiograph of the fused mandibular right first molar and second premolar. Note complete bone regeneration in the periradicular area.

the mandibular right second molar with a supernumerary tooth in its mesiobuccal aspect. Thorough inspection of the crown revealed five intact cusps with a temporary filling in the occlusal groove (Fig. 6).

There was no swelling, sensitivity to percussion or periodontal disease. The pulp responded positively to cold (Endo Ice). Radiographic examination revealed a wide irregular pulp chamber and an extra mesiobuccal root, but no pathology could be observed at the periapical area (Fig. 7). A diagnosis of irreversible pulpitis was made.

Two separate access cavities were prepared. The first corresponded to the molar crown whilst the second corresponded to the supernumerary tooth. A communication between the two cavities was found under the dentine septum. The septum was removed to provide adequate access to the canals. Five canal orifices were found on the mesial side of the pulp chamber floor – two leading to the supernumerary tooth and three leading to the mesial root of the molar.

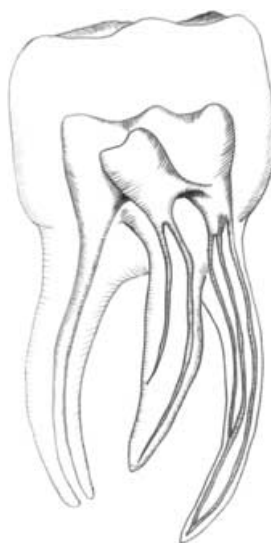


Figure 6 A schematic reconstruction drawing based on the radiographs and clinical examination.



Figure 7 Preoperative radiograph of the geminated second molar tooth (fusion of molar with supernumerary).

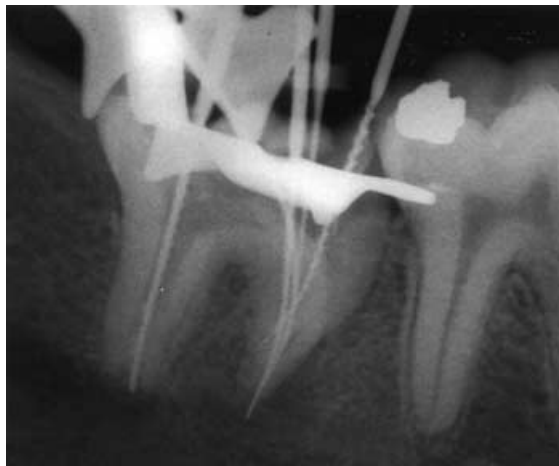


Figure 8 Working length determination radiograph demonstrating five of the six canals.

The canals were instrumented and irrigated with 3% sodium hypochlorite solution. The working length was determined with the help of an electronic apex locator (Apit VII, Osada, Tokyo, Japan) and confirmed by radiograph (Fig. 8). No apical stop could be gained in the distal canal. After instrumentation, the canals were filled with calcium hydroxide and the access cavities were sealed with IRM (Caulk, Milford, DE, USA). At the second appointment, 1 month later, the tooth was asymptomatic. A second application of calcium hydroxide was applied in an attempt to achieve apexification of the distal root. Follow-up 6 months later confirmed an apical stop in the distal root. The tooth was obturated using the lateral condensation technique with AH-26 as a sealer (Dentsply, Konstanz, Germany). The coronal access was sealed with IRM (Caulk, Milford, DE, USA). The final radiograph revealed a dense, well-condensed root filling in all canals. The crown was then restored permanently with amalgam (Fig. 9).

Discussion

Fusion and gemination are developmental anomalies with inherently unusual and bizarre anatomy. A prerequisite for endodontic treatment of anomalous teeth is a careful examination of radiographs from various angles. Lyroudia *et al.* (1997) used computerized 3-D

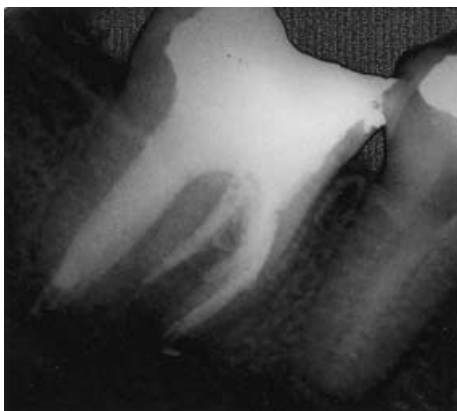


Figure 9 Radiograph with final restoration.

reconstruction of two 'double teeth' *in vitro*. They revealed very complex internal anatomy and stressed the importance of familiarity with the root canal morphology before starting endodontic treatment. Both cases in the present study were treated with the help of a dental operating microscope. Recently, the importance of the operating microscope, a tool for better diagnosis and better quality of care, has been stressed (de Carvalho & Zuolo 2000, Schwarze *et al.* 2002, Yoshioka *et al.* 2002). It is important to emphasize that using higher magnification helped to locate and negotiate the root canals more easily.

Clinically, it may be difficult, if not impossible, to differentiate fusion from gemination when supernumerary teeth are involved. In the first case, there could have been fusion of the mandibular first molar with the second premolar. However, when all the mandibular teeth were counted, a congenital absence of the left (contralateral) premolar was found. The second case could have been either fusion of the second molar with a supernumerary tooth, fusion between second and third molars or gemination of the second molar.

This similarity of clinical features has caused much confusion. Brook & Winter (1970) elucidated the difficulty of deciding whether a tooth is fused or geminated, and proposed that these anomalies be referred to in a neutral term, such as 'double teeth'. Mader (1979) emphasized the similarity of the clinical appearance of fused and geminated teeth and suggested to refer to teeth joined together by dentine as 'fused teeth'. We concur with Holcomb & Pitts (1985) who state that the mere recognition of the anomaly should be sufficient for treatment considerations.

In both the cases presented, access cavities were prepared as two separate coronal entries to preserve as much tooth structure as possible and a communication was discovered between the two pulp chambers. In the first case, the dentine septum was preserved. In the second, the septum was removed to gain direct access to the root canals. According to previous reports, communication between the pulp chambers of fused or geminated teeth is a common feature. It should be removed to facilitate a straight-line access to the root canals (Rome 1984, Goldberg *et al.* 1985, Beltes & Huang 1997, Turell & Zmener 1999). Friedman *et al.* (1986) presented endodontic management in three cases of anomalous teeth. A communication of the regular and fused root canal system was found in all cases. It was concluded that this communication existed in all fused posterior teeth. The above literature reviewed, together with both the cases reported here, confirms this conclusion.

It also confirms the existence of communication between the root canal systems of the fused teeth. Even if a communication between the pulp chambers or root canal systems is initially not discernible clinically, it is recommended that endodontic treatment be performed on these teeth as one entity.

Conclusions

Successful conservative endodontic treatment of two cases with fused/geminated teeth was presented. In both the cases, there was a communication between two parts of the pulp chambers and root canal systems. Thus, endodontic treatment was performed on both parts of these teeth. Strict adherence to biomechanical principles of root canal preparation and use of magnification provided predictable successful treatment of teeth with an unusual anatomy.

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